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SERVICE MODULE REACTION CONTROL SUBSYSTEM PERFORMANCE SPECIFICATION PROJECT APOLLO SPACECRAFT (U)

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30 April 1962

Approved by

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CONTENTS

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CONTENTS

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CONTENTS

ILLUSTRATIONS

1. SCOPE

1.1 Scope.- This specification covers the performance requirements of the Service Module Reaction Control Subsystem of the Project Apollo Spacecraft.

2. APPLICABLE DOCUMENTS

2.1 General.- The following documents shall forma a part of this specification.

Government Documents

Military

MIL-S-404C	Solenoid, Electrical, General Specification for, dated 23 January 1958
MIL-E-8189	Electronic Equipment, Guided Missiles, General Specification for, dated 22 October 1958
MIL-Q-9858	Quality Control System Requirements, dated 9 April 1959
MIL-W-16878D	Wire, Electrical, Insulated, High Temperature, dated 16 January 1961
MIL-W-16878/5	Wire, Electrical, Type EE, 200°C., and 260°C., 1000 Volts, dated 5 July 1961
MIL-P-26539A	Propellant, Nitrogen Tetroxide, dated 31 July 1961
MIL-P-27402	Propellant, Hydrazine, UNS Dimethylhydrazine (50 percent N_2H_4-50 percent UDMH), dated 25 August 1961
MIL-R-27542	Reliability Program Requirements for Aerospace Systems, Subsystems and Equipement, dated 28 June 1961

Standards

Military

MIL-STD-130A	Military Standard Identification Marking of U.S. Military Property, dated 8 September 1958

Bulletins

National Aeronautics and Space Administration

NCP 200-2	NASA Quality Publication, dated 15 December 1961

2.2 Non-Government Documents

Space and Information Systems Division, North American Aviation, Inc.

SID 62-51	Preliminary Spacecraft Performance Specification, dated 28 February 1962
SID 62-65	Apollo Design Criteria Specification dated 28 February 1962
SID 62-81	Crew Subsystem Performance Specification
SID 62-82	Environmental Control Subsystem Performance Specification
SID 62-83	Electrical Power Subsystem Performance Specification
SID 62-84	Navigation and Guidance Subsystem Performance Specification
SID 62-85	System Stabilization and Control Subsystem Performance Specification
SID 62-86	Telecommunications Subsystem Performance Specification
SID 62-240	General Requirements for Preparation for Delivery of Apollo Airborne Equipment

3. REQUIREMENTS

3.0 General Requirements.- The general requirements for the APOLLO Service Reaction Control Subsystem are as specified in NAA Specification SID 62-65.

3.1 Non-Standard Components.- The Service Reaction Control Subsystem shall consist of various types of non-standard components which are listed in Table I. Each of these components is categorized into one of three major categories depending on the unit's function and location in the overall system.

3.1 Non-Standard Components.- continued

Category A - Category A components, as listed in Table I, are those components comprising the helium pressurization system.

Category B - Category B components, as listed in Table I, are those components comprising the hypergolic propellant system.

Category B.1- Category B.1 components, as listed in Table I, are those components comprising the liquid oxidizer system.

Category B.2- Category B.2 components, as listed in Table I, are those components comprising the liquid fuel system.

Category C - Category C components, as listed in Table I, are those components comprising the rocket engine system.

3.2 Materials and Processes.- Materials, standards, protective treatment and processes for all hardware comprising the subsystem will conform to the requirements specified in paragraph 4.6 of NAA Specification SID 62-65 and the non-standard component procurement specifications.

3.3 Design and Construction.- The subsystem shall be designed and constructed to withstand the strains, shocks, vibrations and other conditions incident to shipping, storage, installation, handling and operational service. General requirements for the design and construction of the subsystem are specified in paragraph 4 of NAA Specification SID 62-65. Design criteria pertinent to the perspective of the overall subsystem is specified herein.

3.3.1 Weight.- The design and installed weights of each non-standard component shall be maintained at an absolute minimum.

3.3.2 Lubrication.- Each non-standard component shall require no lubrication during the storage and service life of each component.

3.3.3 Electrical Components.- Each non-standard component, which incorporates an electrical device of any kind, shall meet the requirements of Specification MIL-E-8189.

3.3.4 Solenoids.- Electrical solenoids, which are incorporated in a non-standard component for the purpose of providing or controlling the unit's performance, shall meet the requirements of Specification MIL-S-4040.

3.3.5 Electrical Connections.- To conserve weight, electrical connectors shall not be utilized for connecting the electrical components to the subsystem power supply. Each component shall be wired for single-phase power and shall provide lead wires which mate with subsystem wiring provisions upon installation into the spacecraft. Wires employed in subsystem wiring shall be in accordance with Specification MIL-W-16878, Type E and MIL-C-26500.

3.3.6 Storage Life.- All non-standard components, when sealed and protected, shall withstand five years storage without requiring re-conditioning before operational use. "O"-ring replacement, however, will be acceptable.

3.3.7 Fluid Distribution Lines.- Fluid distribution lines, compatible with the fluids specified in paragraph 3.4.2.1.2 and paragraph 3.4.2.1.3, shall be utilized for fluid distribution throughout the subsystem. The fluid distribution line system is schematically represented in Figure 1.

3.3.7.1 Line Sizes.- Approximate line sizes for the fluid distribution system are noted in Figure 1.

3.3.7.2 Line Connections.- Wherever practical, line-to-line and line-to-component connections shall be welded or brazed to minimize leak points. Where component servicing or possible replacement and overall system maintenance is a requirement, mechanical line-to-component connections shall be utilized. A considerable design and testing effort shall be accomplished for the purpose of developing maximum sealing provisions for this type of connection.

3.4 Performance.-

3.4.1 Mission Performance Requirements.- Mission requirements for the spacecraft shall be as specified in NAA Specification SID 62-51. The service reaction control system shall function to provide stabilization and control, after spacecraft launch, in all phases of flight. The system shall provide ullage acceleration, minor midcourse corrections, terminal rendezvous and docking, retrograde propulsion for command module and service module separation on the reentry phase. The roll thruster shall also be used for pitch and yaw maneuvering whenever the lunar landing module is attached and in earth parking orbit with the booster upper stage attached. The subsystem shall be capable of automatic operation with electrical signals received from the stabilization and control subsystem or by electrical signals received from the crew. A study on malfunction detection shall be investigated to determine the adviseability of shutdown of one system if a thruster in that system fails.

3.4.1.1 Earth Orbit Mission.-

3.4.1.1.1 Earth Orbital Control.- The service reaction control subsystem shall provide the spacecraft stabilization and control during the earth orbiting phase. The subsystem shall provide ullage acceleration propulsion and roll control while the service propulsion subsystem is operating for retrograde prior to reentry.

3.4.1.1.2 Rendezvous and Docking Control.- The subsystem will provide minor translational capability, roll, pitch, and yaw control for rendezvous and docking while in an earth orbit.

3.4.1.1.3 Earth Orbital Corrections.- The subsystem shall provide the minor velocity increments required for correction of the earth-orbit after spacecraft insertion by the launch vehicle.

3.4.1.1.4 Post Atmospheric Abort.- Mission abort during the post-atmospheric portion of the launch trajectory will be accomplished by the Service Propulsion Subsystem. Since the Launch Escape Subsystem is jettisoned shortly after escape from the atmosphere, the Service Propulsion Subsystem shall provide velocity increments, and the Service Reaction Control Subsystem shall provide roll control as required.

3.4.1.2 Translunar and Transearth.-

3.4.1.2.1 Midcourse Velocity Corrections.- The mission trajectory selected will influence the magnitude of midcourse velocity corrections required in translunar or transearth phase. Reaction Control Subsystem shall supply minor velocity increments not supplied by the spacecraft's Service Propulsion Subsystem.

3.4.1.3 Lunar Landing Mission.-

3.4.1.3.1 Lunar Landing.- The Service Reaction Control Subsystem's roll thrusters shall provide pitch and yaw maneuvering when the Lunar Landing Module is attached.

3.4.1.3.2 Lunar Launch.- The subsystem shall provide roll control for the Service Propulsion Subsystem on lunar launch.

3.4.1.4 Preparation for Reentry.-

3.4.1.4.1 Preparation for Reentry.- The subsystem shall provide directional and attitude control of the spacecraft prior to reentry of the command module.

3.4.1.4.2 Separation.- The subsystem shall provide a sustained

3.4.1.4.2 Separation. - continued

translational acceleration of the Service Module along two body axis after the separation from the Command Module.

3.4.2 System Operation. -

3.4.2.1 General. - The complete service reaction control subsystem consists of two identical reaction control systems identified as system A and system B. The identical systems are interconnected as shown in Figure 1. The two identical systems shall be operated simultaneously during normal subsystem operation. Each control system consists of a pressurized helium storage and distribution system, an oxidizer storage and distribution system, a fuel storage and distribution system and eight rocket engine systems.

3.4.2.1.1 Pressurized Helium System. - The pressurized helium system shall be composed of the Category A components listed in Table I and shown schematically in Figure 1. Each helium supply shall be contained within one spherical tank which shall be cradle mounted to minimize detrimental tank flexures. During ground service operations and prior to initial subsystem pressurization, the high pressure helium will be confined to the storage tanks by means of the normally closed squib valve. The squib valve shall contain an integral helium filter to protect the downstream regulators and check valves from harmful foreign particles. The manually controlled normally open solenoid valve shall provide the means of isolating the storage tank from the downstream components in the event of downstream leakage or component failure. Upon command, the squib valve shall open the helium supply to a pressure regulation system consisting of two individual regulators connected in series. The check valves downstream of the regulators shall prevent the propellants from entering the helium system in the event of failure of a propellant tank positive-expulsion device. The relief valve shall contain an integral helium filter and shall prevent a detrimental pressure buildup in the propellant storage tanks. The vent valve shall provide means for venting the helium system downstream of the check valves during propellant servicing operations and helium depressurization operations. The solenoid valves which connect the high pressure and regulated pressure areas of system A and system B shall provide an alternate path for pressurized helium in the event that a regulator fails closed in either system.

3.4.2.1.2 Oxidizer System. - The oxidizer system shall be composed of the category B.1 components listed in Table 1 and shown schematically in Figure 1. The fill valve will provide the facility for servicing the oxidizer system during ground operations. The oxidizer supply shall be contained within a hemi-spherically domed cylindrical tank which shall b[redacted]

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TABLE 1

Service Reaction Control Subsystem Components

Category	Figure 1 Code No.	Component Title	Function
A	A-1	Vessel-Helium Pressure	Storage of high pressure helium
A	A-2	Valve-Helium Fill Manual	Fill point during ground servicing operations
A	A-3	Valve-Helium, Squib	Confine high pressure helium to storage area during ground servicing operations
A	A-4	Valve-Helium, Solenoid Operated	Isolate the storage area in the event of a downstream failure
A	A-5	Regulator-Helium Pressure	Maintains the required constant downstream pressure
A	A-6	Check Valve Helium Pressure	Presents oxidizer and/or fuel from backing up into helium system
A	A-7	Relief Valve Helium Pressure	Presents overpressurization of the fuel and oxidizer system
A	A-8	Valve-Vent Helium Pressure	Depressurize low pressure side of helium system
A	A-9	Coupling-Check Helium Pressure	Provide pressure check points
A	A-10	Valve-Helium, Squib	Connect helium system of system A and B

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TABLE 1

Service Reaction Control Subsystem Components-continued

Category	Figure 1 Code No.	Component Title	Function
B	B.1-1	Tank Oxidizer	Storage of nitrogen tetroxide (N_2O_4)
B	B.1-2	Valve-Oxidizer Fill, Manual	Fill point during ground servicing operation
B	B.1-3	Burst Diaphragm-Oxidizer	Confine N_2O_4 to storage area until it is pressurized
B	B.1-4	Valve-Oxidizer Solenoid Operated	Isolate storage area in the event of downstream failure
B	B.1-5	Coupling-Check Oxidizer	Provide pressure check point
B	B.1-6	Valve-Isolation Solenoid Operated	Isolates oxidizer system A from system B
B	B.2-1	Tank-Fuel	Storage of a 50/50 blend of UDMH and Hydrazine (N_2H_4)
B	B.2-2	Valve-Fuel Fill, Manual	Fill point during ground servicing operation
B	B.2-3	Burst Diaphragm-Fuel	Confine fuel to storage area until it is pressurized
B	B.2-4	Valve-Fuel Solenoid Operated	Isolate storage area in the event of downstream failure
B	B.2-5	Coupling-Check Fuel	Provide pressure check point
B	B.2-6	Valve-Isolation Solenoid Operated	Isolates fuel system A from system B
C	C-1	Propellant Valves (2)	Control Propellant flow to the engine on demand
C	C-2	Thrust Chamber	Provides impulse for spacecraft control

3.4.2.1.2 Oxidizer System.- continued
cradle mounted. The tank shall be equipped with a positive-expulsion device. Pressurized helium from the helium system shall act on the opposite side of the positive-expulsion device forcing the oxidizer through the oxidizer distribution system to the rocket engines at the required feed pressure. During ground service operations and prior to actuation of the helium system squib valve, the oxidizer will be confined to the storage tank by means of the burst diaphragm assembly. The burst diaphragm assembly shall contain an integral filter to protect the rocket engines from harmful foreign particles. Upon initial pressurization of the subsystem the pressurized oxidizer shall rupture the burst diaphragm and flow to the normally closed oxidizer injector valves of the rocket engines. The manually controlled, normally open solenoid valve shall provide the means of isolating the oxidizer storage tank from the rocket engines in the event of a leak in the oxidizer distribution system or a malfunction of a rocket engine.

3.4.2.1.3 Fuel System.-The fuel system shall be composed of the Category B.2 components listed in Table I and shown schematically in Figure 1. The fill valve will provide the facility for servicing the fuel system during ground operations. The fuel supply shall be contained within a hemispherically domed cylindrical tank which shall be cradle mounted. The tank shall be equipped with a positive-expulsion device. Pressurized helium shall act on the opposite side of the positive-expulsion device forcing the fuel through the fuel distribution system to the rocket engines at the required feed pressure. During ground servicing operations and prior to actuation of the helium system squib valve, the fuel will be confined to the storage tank by means of the burst diaphragm assembly. The burst diaphragm assembly shall contain an integral filter to protect the rocket engines from harmful foreign particles. Upon initial pressurization of the subsystem, the pressurized fuel shall rupture the burst diaphragm and flow to the normally closed fuel injection valves of the rocket engines. The manually controlled, normally open solenoid valve shall provide the means of isolating the fuel tank from the rocket engines in the event of a leak in the fuel distribution system or a malfunction of a rocket engine.

3.4.2.1.4 Engine System.-

3.4.2.1.4.1 General Requirements.- The service reaction control subsystem shall employ 8 rocket engines for roll control, 4 engines for pitch control and 4 engines for yaw control. Control in each axis shall be supplied by pairs of engines arranged to provide rotation without translation and translation without rotation. One engine of each pair shall be supplied by one of the independent propellant supply systems. 4 engines shall be mounted in clusters of four on the external surface of the service module. The center of each cluster shall be located in a plane passing through the C. G. of the earth orbit vehicle configuration, perpendicular to the longitudinal centerline.

3.4.2.1.4.2 Rocket Engine.- The rocket engine shall be a pulse-modulated pressure fed, radiation cooled thrust generator.

3.4.2.1.4.2.1 Thrust.- The rocket engine shall develop a vacuum thrust during continuous operation of 100 pounds plus or minus 5 percent.

3.4.2.1.4.2.2 Thrust Transient Rate.- The rocket engine shall demonstrate a thrust buildup and thrust decay as described in Figure 2.

3.4.2.1.4.2.3 Specific Impulse.- The rocket engine shall achieve the following specific impulses during operation under vacuum conditions.

3.4.2.1.4.2.3.1 Continuous Operation.- The rocket engine shall develop a specific impulse of 300 seconds when operating for periods in excess of one second.

3.4.2.1.4.2.3.2 Pulse Mode Operation.- The rocket engine shall develop the specific impulse levels defined in Figure 3 when operating at pulse widths less than one second.

3.4.2.2 Component Performance.- Preliminary performance requirements for the spacecraft are specified in NAA Specification SID 62-51. A summary of the functional requirements for each category A, B, and C non-standard component is outlined in Table 1. Performance requirements which apply to each component category in general, are as follows:

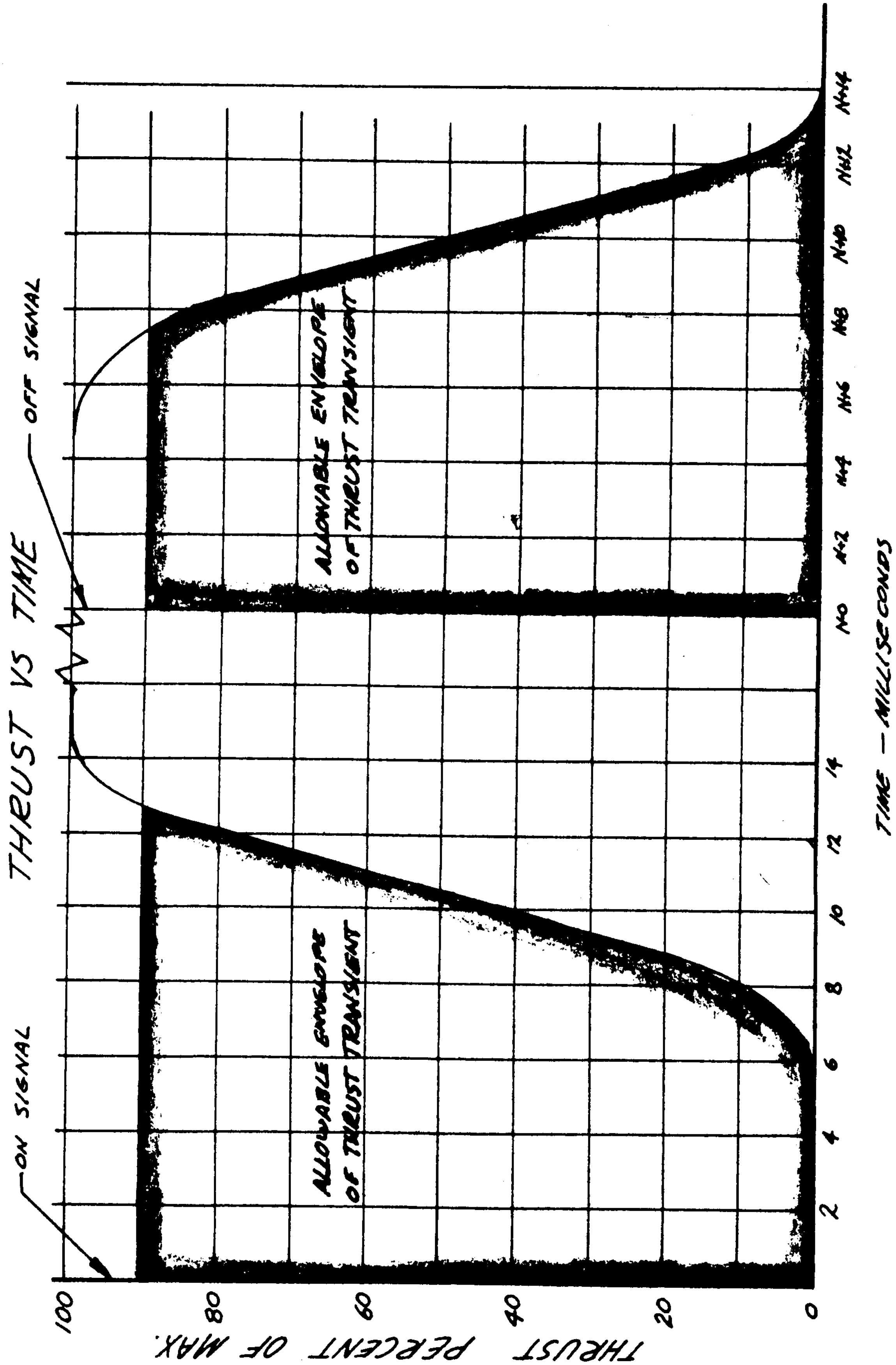
3.4.2.2.1 Fluid Compatibility.-

3.4.2.2.1.1 Category A Components.- All Category A pressurization system components shall be compatible with high grade oil free commercial helium for long periods of exposure and intermittent exposures of short duration.

3.4.2.2.1.2 Category B.1 Components.- All Category B.1(oxidizer system)non-standard components shall be compatible with nitrogen tetroxide (N_2O_4) in accordance with Specification MIL-P-26539, for long periods of exposure and intermittent exposures of short duration.

3.4.2.2.1.3 Category B.2 Components.- All Category B.2 (fuel system) non-standard components shall be compatible with a mixture of 50 percent hydrazine (N_2H_4) and 50 percent unsymmetrical dimethylhydrazine (UDMH) per Specification MIL-P-27402, for long periods of exposure and intermittent exposures of short duration.

3.4.2.2.1.4 Category C Components.- All Category C(engine system) non-standard components shall be compatible with the fluids specified in paragraphs 3.4.2.2.1.2 and 3.4.2.2.1.3.


THRUST VS TIME
ON SIGNAL
OFF SIGNAL
ALLOWABLE ENVELOPE OF THRUST TRANSIENT
ALLOWABLE ENVELOPE OF THRUST TRANSIENT
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80
60
40
20
0
THRUST PERCENT OF MAX.
2
4
6
8
10
12
14
N+0
N+2
N+4
N+6
N+8
N+10
N+12
N+14
TIME — MILLISECONDS

FIGURE 2

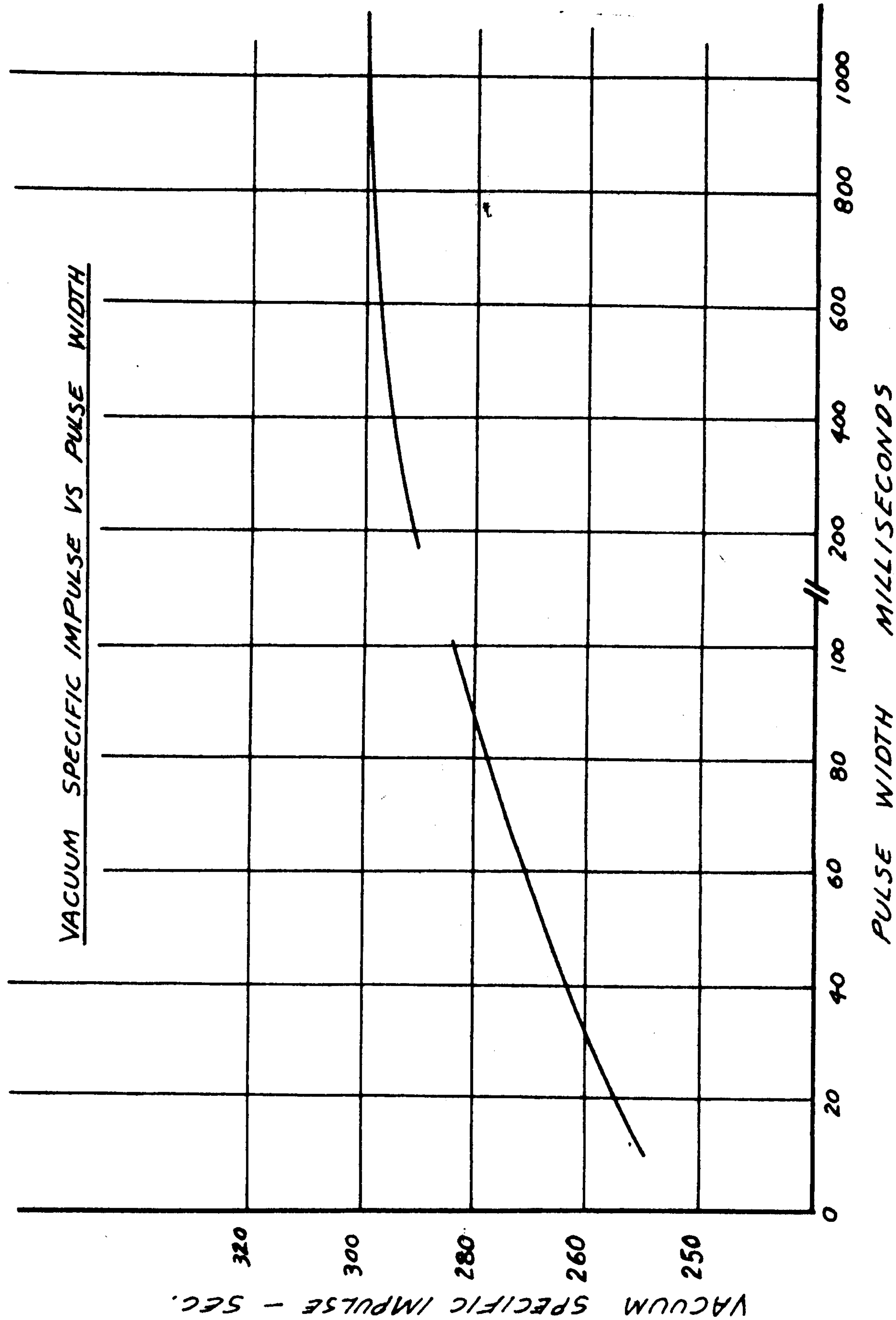

VACUUM SPECIFIC IMPULSE VS PULSE WIDTH
0
20
40
60
80
100
200
400
600
800
1000
PULSE WIDTH MILLISECONDS
320
300
280
260
250
VACUUM SPECIFIC IMPULSE - SEC.

FIGURE 3

3.4.2.2.2 Pressures.- Helium source pressure for the pressurization shall be approximately 4500 psig. Propellant shall be distributed to the engine at an approximate operating pressure of 170 psig.

3.4.2.2.3 Leakage.- All non-standard components shall be designed to perform as required with zero leakage.

3.4.2.2.4 Electrical Requirements. - Subsystem power requirements are schematcially represented in Figure 2.

3.4.2.2.4.1 Power Supply.- All components which are electrically actuated shall operate from a power supply having the following characteristics:

Steady State Voltage	24-30 volts d.c.
Transient Voltage Limits	25-30 volts d.c. Recovery time from one steady-state level to another upon load changes is less than 0.7 sec
Ripple Voltage	± 250 millivolts peak to peak maximum

3.4.2.2.4.2 Grounding.- All non-standard components, which are electrically actuated, shall not be internally grounded.

3.4.2.2.4.3 Dielectric Strength.- All components, which are electrically actuated, shall withstand 1500 volts (RMS) at commercial frequency, for a period of one minute, without evidence of insulation breakdown or flashover.

3.4.2.2.4.4 Insulation Resistance.- The insulation resistance for each non-standard component, which is electrically actuated, shall be a minimum of 100 megohms, when a potential of 500 volts d.c is applied for a period of one minute.

3.4.2.2.5 Service Life.- All non-standard components shall be capable of withstanding operating pressure, without permanent deformation, detrimental damage or leakage, for a period greater than that expected during normal in-service operation.

3.4.2.2.6 Endurance.- All non-standard components shall be capable of performing a total number of operating cycles greater than the total number of cycles expected during normal in-service operation.

3.4.3 Servicing.- The following procedures are recommended for servicing the service reaction control subsystem during pre-launch operations.

3.4.3.1 Servicing Time.- Pressurization systems and propellant system fluids shall be loaded into the spacecraft after the crew has been placed aboard.

3.4.3.2 Propellant Loading Sequence.- The propellant fluids shall not be loaded simultaneously. The liquid oxidizer shall be loaded prior to the loading of the liquid fuel.

3.4.3.3 Loading Points.- Each helium, fuel and oxidizer tank shall be provided with a single loading point. Manual quick disconnect point to provide the required ground to spacecraft fluid median transfer connections.

3.4.3.4 Vent Points.- During fuel and oxidizer loading operations, the opposite side of the positive expulsion device shall be relieved of all restricting pressure by means of the helium downstream vent valve. Manual quick-disconnect type couplings shall be used at each vent point to provide the required ground to spacecraft connections.

3.4.3.5 Positive Sealing Provisions.- For the purpose of positively sealing the pressurization and propellant systems upon the completion of the loading operations, the airborne quick disconnect half coupling shall incorp- rate a manually installed dust cover. The dust cover shall contain second- ary sealing provisions.

3.4.4 Preflight Checkout.- The following preflight checkout provisions shall be incorporated into the design of the service reaction control sub- system.

3.4.4.1 Fittings.- Fittings, as shown in Figure 1, shall be provided to permit purging and helium leakage checks throughout the entire subsystem. The fittings shall also be utilized for pressure regulator and control valve flow checks and for checking normal and emergency valve sequencing.

3.4.4.2 Instrumentation.- Provisions for the checking of all sen- sors and other instrumentation shall be incorporated.

3.4.4.3 Expendable Component Replacement.- Provisions for the replacement of expendable components, such as squib valves and burst discs, shall be incorporated.

3.4.4.4 Filter Replacement.- Provisions for the cleaning or replace- ment of system filters shall be incorporated.

3.4.4.5 Subsystem.- Provisions for the static firing of the entire subsystem, prior to flight, shall be incorporated.

3.4.5 Subsystem Integration.- The service reaction control subsystem shall be integrated with the following spacecraft subsystems.

[redacted]

3.4.5.1 Crew Subsystem.- The service reaction control subsystem shall be integrated with the crew subsystem, as specified in NAA specification SID 62-81.

3.4.5.1.1 Normal Functions.- Preparation of the subsystem for engine ignition shall be a crew function. The crew shall monitor the following subsystem parameters:

(a) helium tank pressures and temperatures
(b) oxidizer manifold pressure
(c) fuel manifold pressure.

3.4.5.1.2 Emergency Functions.- In the event of an emergency, the crew shall be able to manually override the automatic subsystem operations. The crew shall have the following additional capabilities:

(a) terminating and isolating the operation of either system A or system B in the event of the failure of one of these systems

(b) providing an alternate path for the pressurized helium in the event of the failure of the pressure regulation system

(c) providing a means for using the fuel and/or oxidizer of one system (A or B) to feed the engines of both systems in the event of the failure of the fuel and/or oxidizer supply of one of the systems

(d) the rocket engines shall be capable of operation by electrical signals manually originated by the crew.

3.4.5.2 Electrical Power Subsystem. - The service reaction control shall be integrated with the electrical power subsystem, as specified in NAA Specification SID 62-83.

3.4.5.2.1 Function. - The electrical power subsystem shall provide all electrical power requirements of the service reaction control subsystem.

[redacted]

3.4.5.3 Guidance and Control Subsystems. - The service reaction control lsubsystem shall be integrated with the navigation and guidance subsystem and the system stabilization and control subsystem as specified in NAA Specification SID 62-84, and SID 62-85, respectively.

3.4.5.3.1 Function. - The service reaction control subsystem shall accept control signals from the guidance and control subsystems.

3.4.5.4 Telecommunication Subsystems. - The service reaction control subsystem shall be integrated with the telecommunications subsystem, as specified in NAA Specification SID 62-86.

3.4.5.4.1 Function. - The telecommunications subsystem shall provide the instrumentation and display values for the crew subsystem monitoring functions specified in paragraph 3.4.5.1.1.

3.4.6 Environmental Requirements. - General environmental requirements for the service reaction control subsystem are specified in paragraph 6 of NAA Specification SID 62-65.

3.4.6.1 Propellant Temperature. - The propellant temperature shall be maintained within the temperature range of +40 F to +120 F.

3.5 Identification of Product. - The identification of all components comprising the service reaction control subsystem shall be in accordance with Specification MIL-STD-130.

3.6 Cure Date. - Marking, governing replacement of synthetic rubber parts (excluding silicone rubber compounds) shall be in accordance with ANA Bulletin 438.

3.7 Reliability Requirements. -

3.7.1 General. - General reliability requirements for the spacecraft are specified in paragraph 7 of NAA Specification SID 62-65. A reliability program that conforms to the requirements of Specification MIL-R-27542 and NASA Publication NCP 200-2 shall be established for all components comprising the service reaction control subsystem.

3.7.2 Numerical Reliability Requirements. - The service reaction control subsystem shall have a reliability of .996 under the environmental conditions and operating life specified.

3.7.3 Reliable Operating Life. - The service reaction control subsystem shall have a reliable operating life of at least 1000 seconds without removal for servicing.

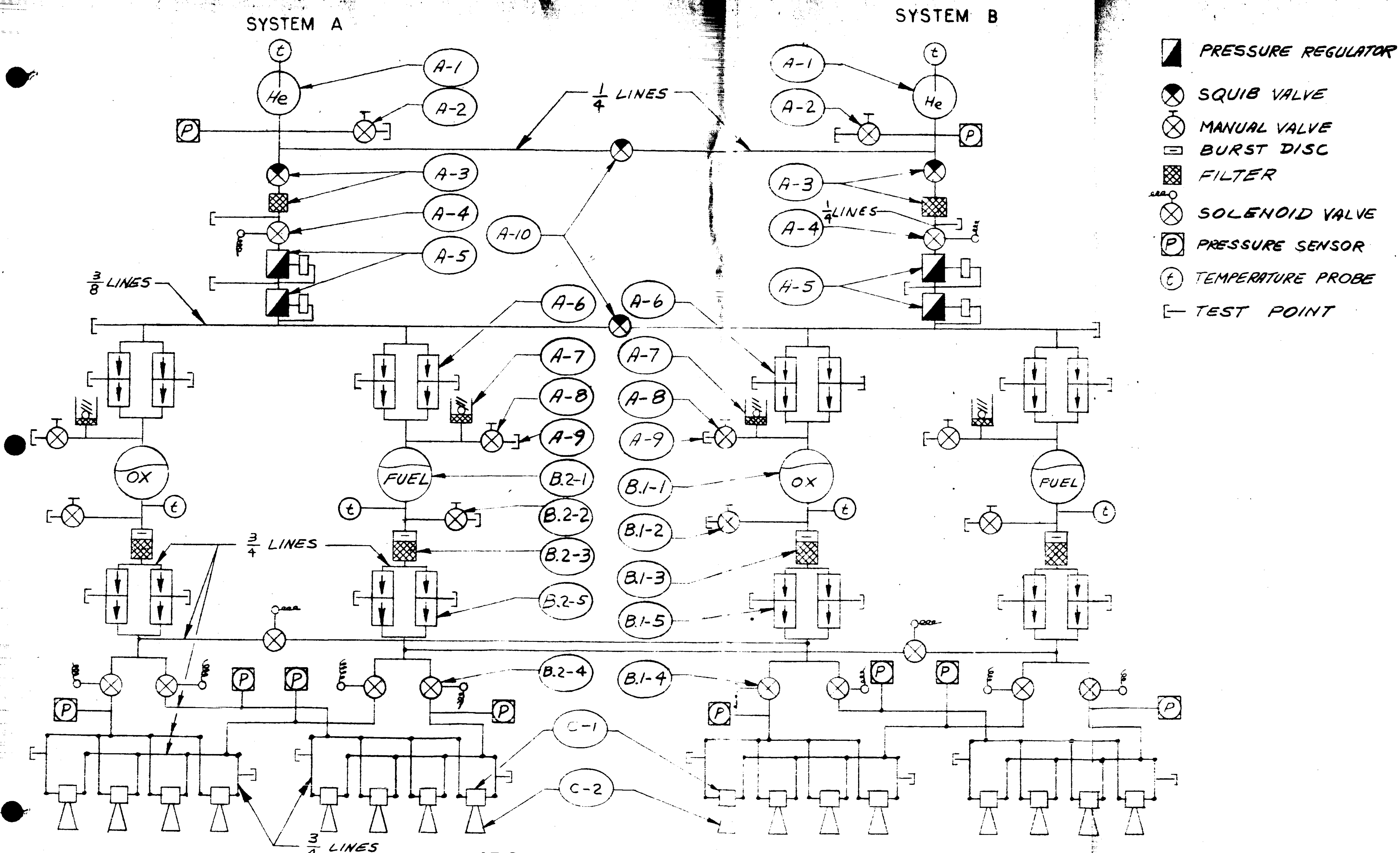
4. QUALITY ASSURANCE PROVISIONS

4.1 General. - The requirements specified in MIL-Q-9858 and NASA Quality Publication NCP 200-2 form a part of this specification. Inspections and tests to determine conformance of the system to contract and specification requirements shall be conducted prior to submission of the article to NASA or in the presence of a NASA representative. Results of inspection tests on major components shall be submitted to NASA for review. Other acceptance test data relative to this specification shall be maintained and made available for review by NASA upon request.

5. PREPARATION FOR DELIVERY

5.1 General. - Preparation for delivery of the subsystem shall be in accordance with Specification SID 62-240. All preservation and packaging methods shall be compatible with the subsystem and in accordance with delivery modes, destinations, and anticipated storage periods.

6. NOTES



REACTION CONTROL SYSTEM,
SERVICE MODULE, SCHEMATIC, FIGURE I.